

Soil Drying and Rewetting Effects on N and P Mineralization



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Rationale

Soils are naturally subjected to drying and rewetting cycles, which can impact soil C, N, and P dynamics. Mineralization of nutrients is largely dependent upon the activity of soil microorganisms. Similarity in temporal responses to drying and rewetting among nutrients is likely.

Objectives

- 1 Characterize dynamics of C, N, and P following drying and rewetting compared with continuously moist soil.
- 2 Determine the effects of previous animal manure application to soil on nutrient dynamics.
- 3 Confirm the ability of a short-term incubation method to predict N and P mineralization from soil with different levels of nutrient availability.

Experimental Setup

Houston Black Clay supplied with 5 nutrient loads and cropped to corn the previous year:

- 1 Control - no fertilizer
- 2 Control - inorganic fertilizer
- 3 Composted dairy manure - 22 Mg/ha
- 4 Composted dairy manure - 45 Mg/ha
- 5 Composted dairy manure - 67 Mg/ha

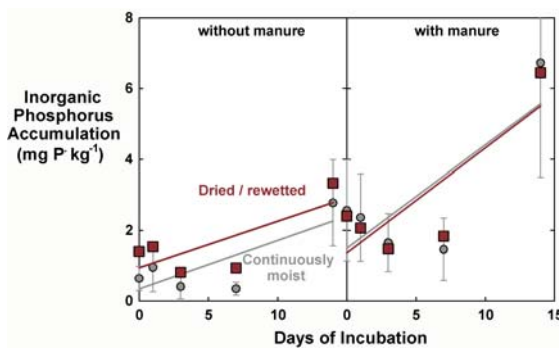
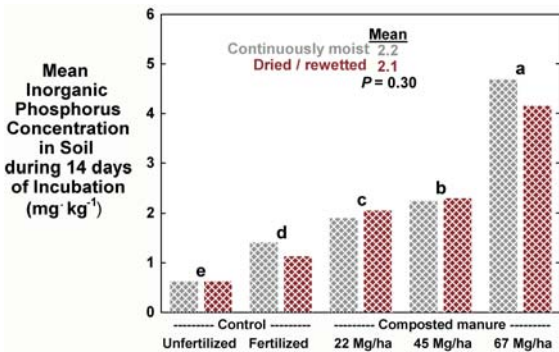
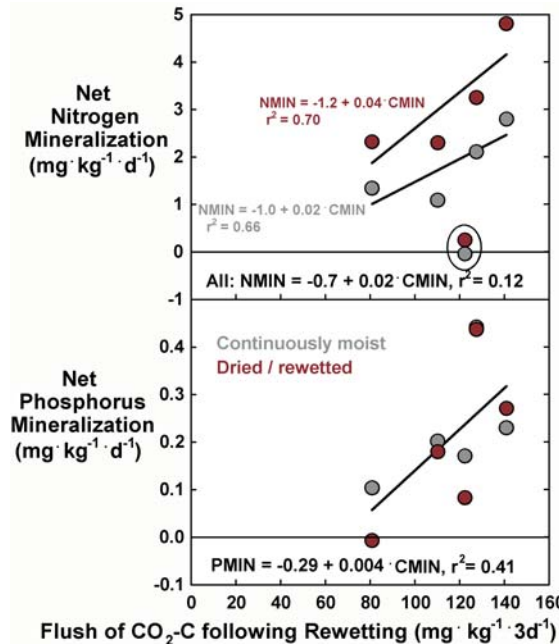
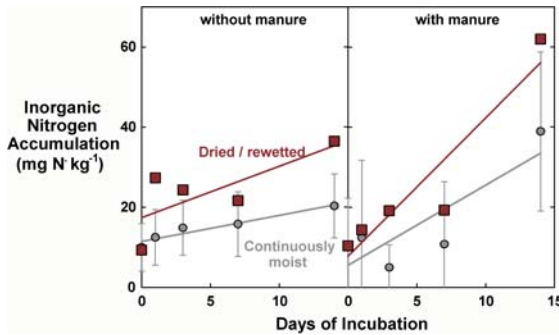
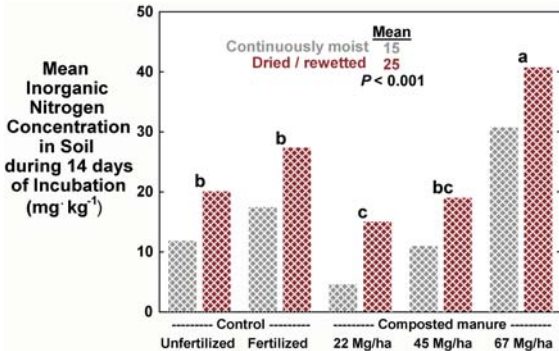
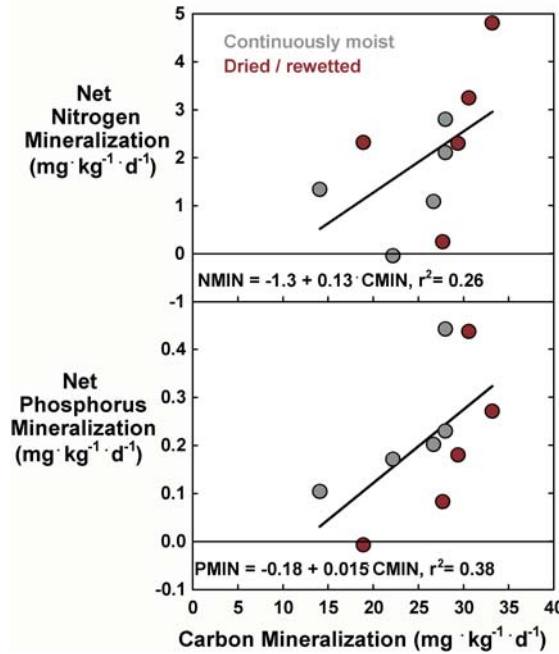
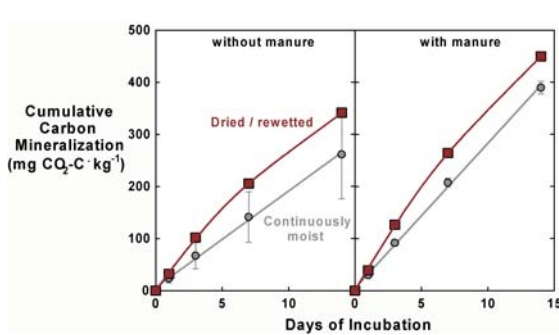
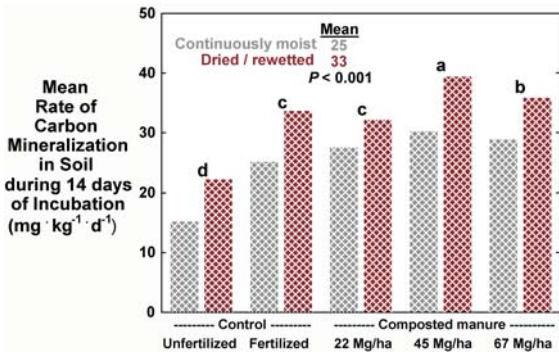
All soil initially dried. Preincubation at 25 C and 50% WFPS for 15 days prior to initiation of treatment:

- 1 Continuously moist - no disturbance
- 2 Oven-dried and subsequently rewetted the next day

Results

Manure addition increased C, N, and P mineralization relative to the unfertilized control, but not necessarily relative to the fertilized control. Drying and rewetting caused a flush of C and N mineralization, but did not affect P mineralization.

Whether manure was added to soil or not, did not change the relationship that was observed between steady-state C mineralization and N and P mineralization or between the flush of CO₂ released during 3 days and N and P mineralization.



CONCLUSION

Even within a relatively narrow range, the flush of CO₂ during 3 days could predict N and P mineralization in soil.